SHARP

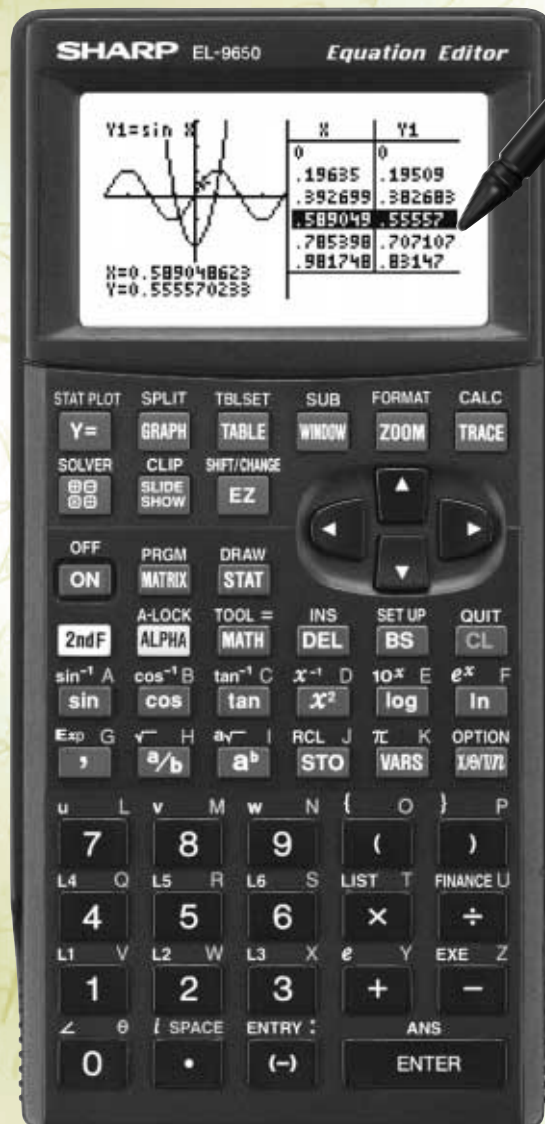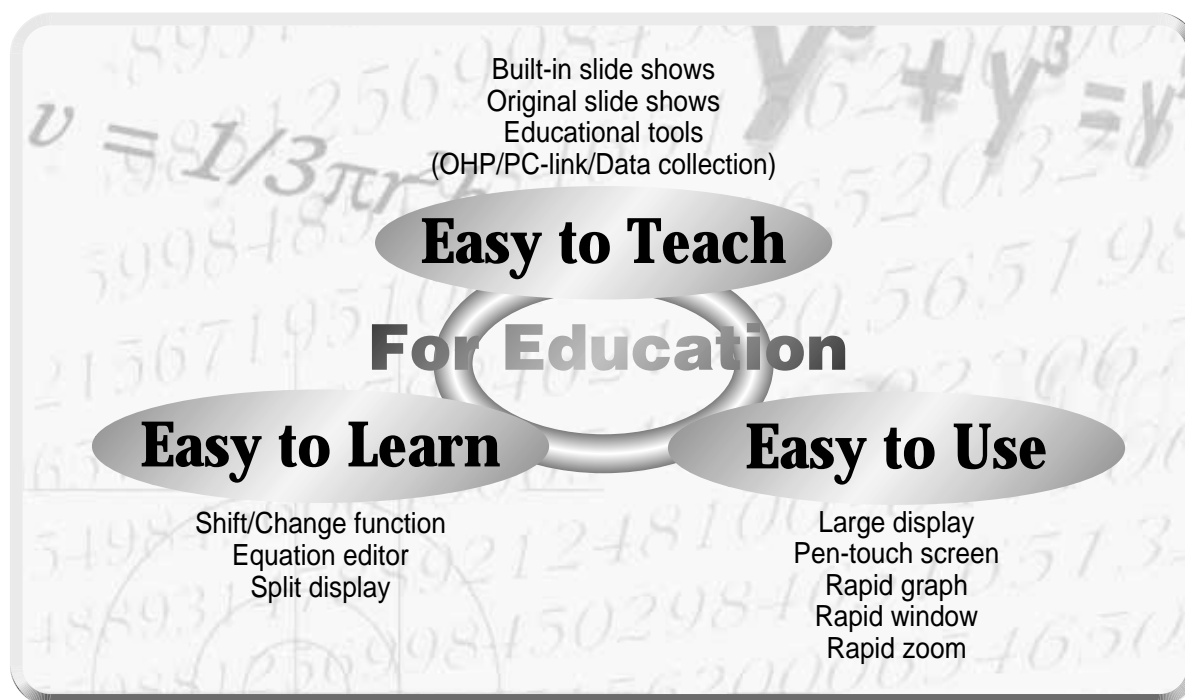## Graphing Calculator
EL-9650/9600c
OPERATION GUIDE

Introduction

The EL-9650/9600c was developed to meet the needs of an expanding education market and is based on three concepts: easy to teach, easy to learn and easy to use. The EL-9650/9600c has been designed with simplified operations and time-saving features, allowing teachers to concentrate on actual teaching.

This manual was designed to introduce teachers to the unique features of the EL-9650/9600c using detailed operation examples.
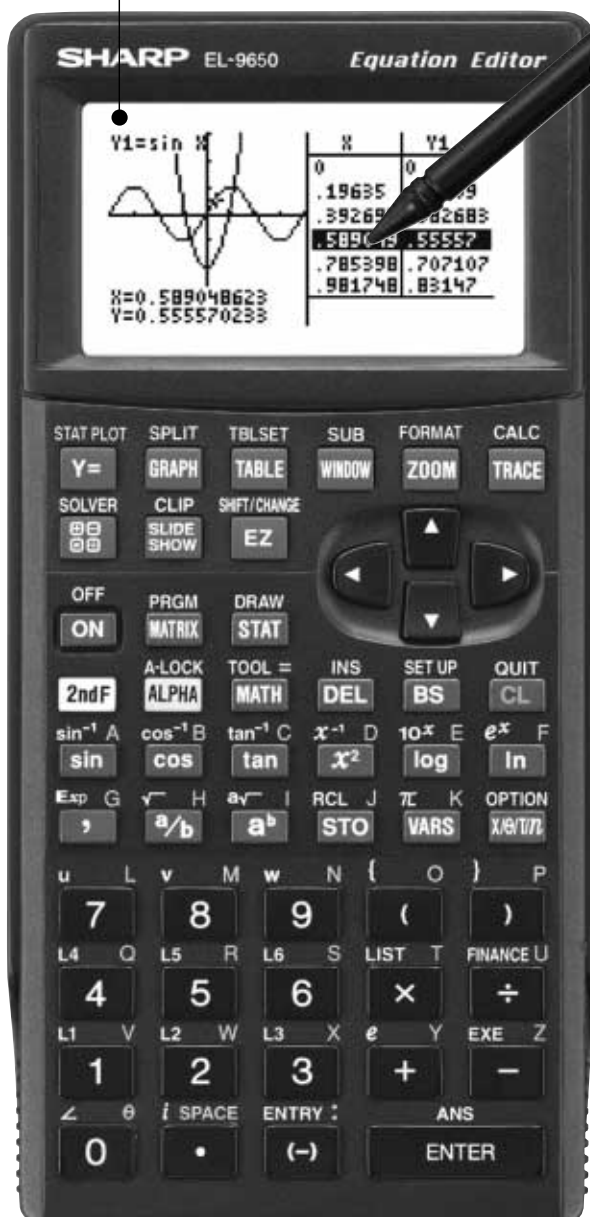
Built-in slide shows
Original slide shows
Educational tools
(OHP/PC-link/Data collection)

Easy to Teach

For Education

Easy to Learn

Easy to Use

Shift/Change function
Equation editor
Split display

Large display
Pen-touch screen
Rapid graph
Rapid window
Rapid zoom

Contents

Sales points

❶ Large 132 x 64-dot display

❷ Easy Pen-touch screen

❸ Graph **Shift/Change** shows how "changing" the graph affects the equation

❹ Slide Shows reduce class preparation time

❺ Equation Editor shows equations just as in textbooks

❻ Rapid graph/Rapid window simplify graphing procedures

❼ Rapid zoom allows easy adjustment of window size

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Basic operation

Power ON/OFF

ON	· · · · · · · Power on

OFF
| 2nd F | ON | · · ·Power off |

| CL | · · · · · ·Erase equations and remove error displays |

QUIT
| 2nd F | CL | · · ·Cancel of previous function (Escape) |

Function keys

Y=	Use to enter equations
GRAPH	Use to draw graphs
TABLE	Use to view table of function value
WINDOW	Use to set size of viewing window
ZOOM	Use to adjust the viewing range
TRACE	Use to trace graphs
⊞⊟⊠÷	Use to enter calculation mode
SLIDE SHOW	Use to enter slide show mode
EZ	Use to operate Rapid Graph/Rapid Window and Rapid Zoom functions

Names of parts

❶ Graphing keys

❷ Power supply ON/OFF key

❸ Alphabet specification key

❹ Secondary function specification key

❺ Display screen

❻ Cursor movement keys

❼ Clear/Quit key

❽ Variable enter key

❾ Calculation execute key

❿ Communication port for peripheral devices

SHARP EL-9650 *Equation Editor*
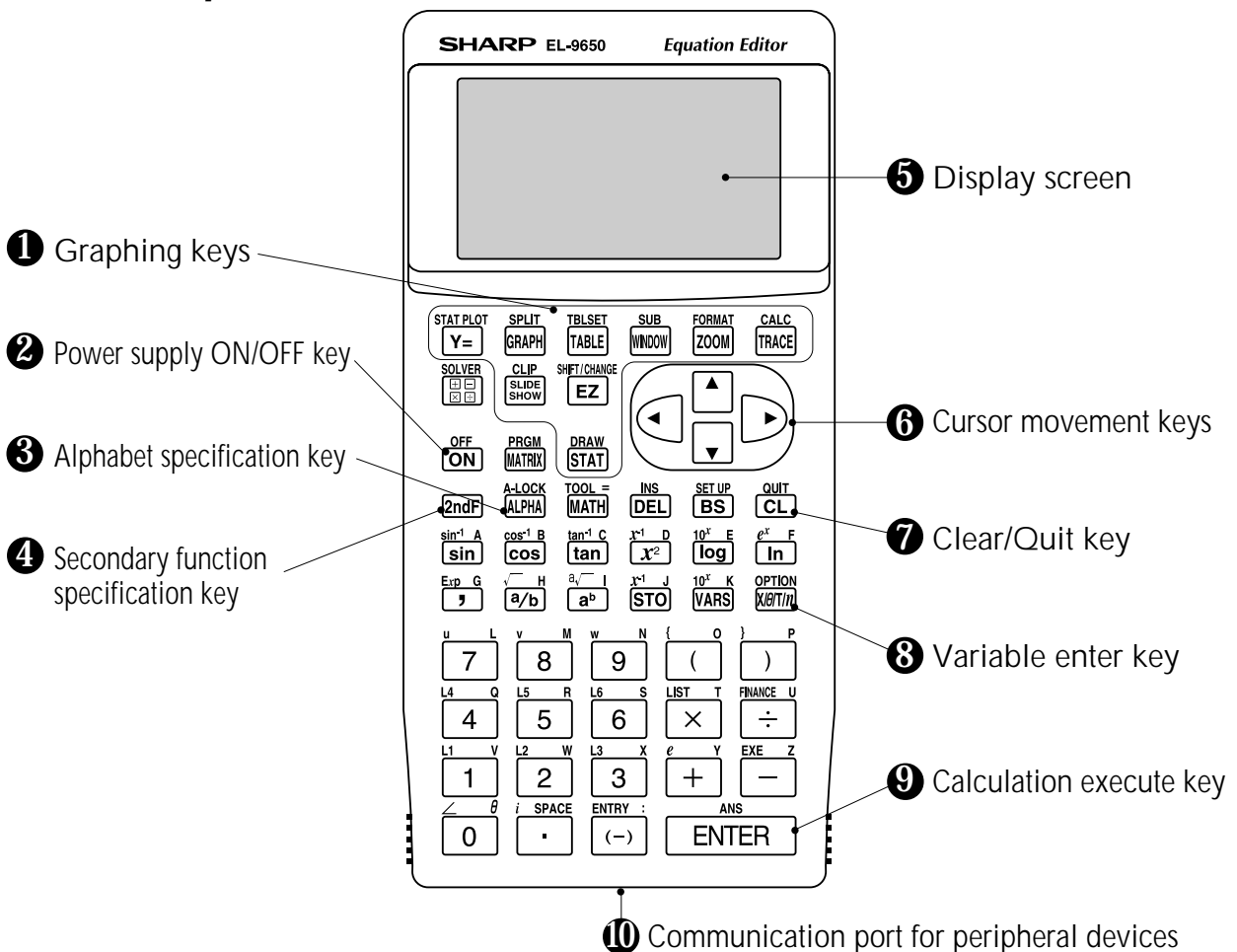
Basic operation

Guide to key use

Press 2nd F to use secondary functions (in yellow).

Press ALPHA to use the alphabet keys (in blue).

Example: sin ^A

To select "sin": sin

To select "sin⁻¹": 2nd F sin

To select A: ALPHA sin

SET UP menu

Press 2nd F SET UP .

- Contents displayed on the right side of the screen are the current settings.

[There may be differences in the results of calculations and graph plotting depending on the SET UP settings.]

Adjusting screen contrast

- The contrast adjust screen will appear when pressing

  2nd F OPTION .

Press + to darken contrast.

Press − to lighten contrast.

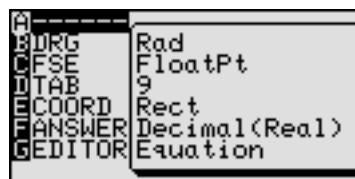Pen/Touch (Change the contrast by touching + or − using the pen)

- With pen-touch mark Pen/Touch , all operations can be performed using the pen touch.
- Operation examples for the pen-touch key are given assuming that the operation is started from the default value setting.

Reset function

1) When trouble occurs

Press 2nd F OPTION E to enter the reset mode.

- Use this function (1 or 2) to return all settings to the default value or to delete all data.

2) All RESET operation

- If trouble still occurs, proceed as follows:

  1. Press the RESET switch on the back.
  2. Press ON .
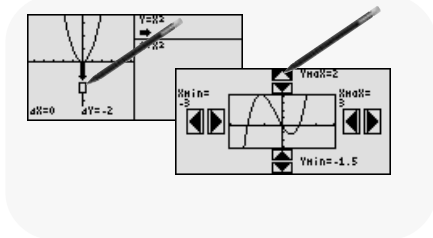   - Returns to the initial display.

CAUTION
Do not press CL in step 2. It will delete all data stored in the calculator.

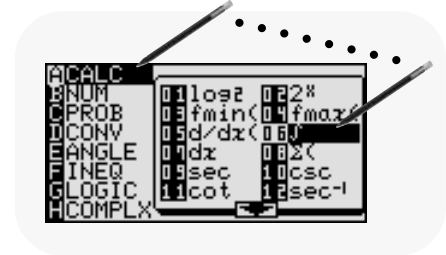**SHARP**

Pen-touch operation

Pen-touch screen offers convenient operations. Use it to select from the menu displays or shift a graph, fast and easy. All operations can also be performed without the pen.
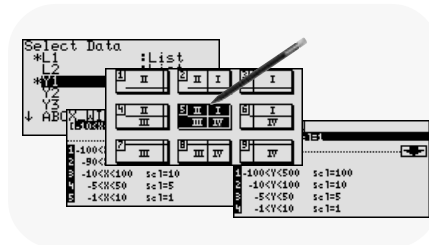
❶ Convenient to make changes to graphs

❸ Easy to move between displays

❷ Select menu options with a touch of the pen

See how a simple choice can be made directly from the screen.

Example: Convert "3.55" to d,m,s (degree, minute, second)

	Pen-touch operation	*Key operation*	*Display*
1)	⊞⊟⊠÷ CL 3 · 5 5 MATH	⊞⊟⊠÷ CL 3 · 5 5 MATH	
2)	Pen-touch [**D** CONV]	▼ ▼ ▼ (or **D**)	
3)	Pen-touch [**2** →dms] twice	ENTER ▼ ENTER (or **2**)	3.55→dms
4)	ENTER	ENTER	3.55→dms 3°33'0"

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Equation editor

The equation editor allows equations to be viewed just as they are written in textbooks. This aids student comprehension and allows mistakes to be found quickly.

Example

Input the equation and see how it can be easily viewed with the equation editor. $\int_0^{\frac{1}{2}} \dfrac{x}{\sqrt{1-x^2}} dx$
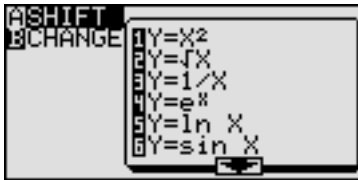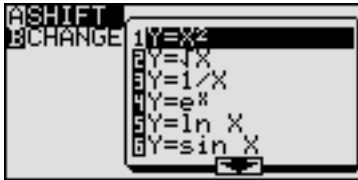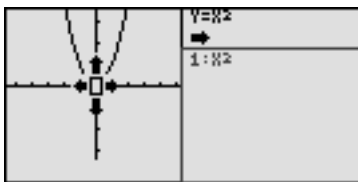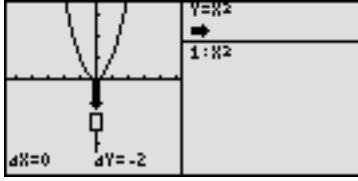

	Key Operation	Display	Notes
1	⊞⊟ ⊠⊟ CL	—	Clear the display.
2	MATH A ENTER ▶ ▼ ▼ ENTER Pen/Touch (or MATH A 0 6)	ACALC / BNUM / CPROB / DCONV / EANGLE / FINEQ / GLOGIC / HCOMPLX [01]log2 [02]2ˣ [03]fmin([04]fmax([05]d/dx([06]∫ [07]∫dx [08]Σ([09]sec [10]csc [11]cot [12]sec⁻¹	Select CALC and ∫ (Integral function)
3	0 ▶ 1 a/b 2 ▶ ▶	$\displaystyle\int_0^{\frac{1}{2}}$	Enter the range of the integral.
4	X/θ/T/n a/b 2nd F √ 1 — X/θ/T/n x² ▶ ▶	$\displaystyle\int_0^{\frac{1}{2}} \frac{X}{\sqrt{1-X^2}}$	Enter $\dfrac{x}{\sqrt{1-x^2}}$
5	MATH ENTER ▼ ▼ ▼ ENTER Pen/Touch (or MATH A 0 7)	$\displaystyle\int_0^{\frac{1}{2}} \frac{X}{\sqrt{1-X^2}} dx$	Complete equation input.
6	ENTER	$\displaystyle\int_0 \frac{X}{\sqrt{1-X^2}} dx$ .133974596	Calculate the expression. [The mark in the upper right corner will blink for approximately 10 seconds, indicating that the expression is being calculated.]
7	2nd F ENTRY	$\displaystyle\int_0^{\frac{1}{2}} \frac{X}{\sqrt{1-X^2}} dx$	Review the input equation.

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Shift (Change the location of graphs)

Graph shift function helps students grasp the relationship between an equation and its graph. Shift the graph's location without changing its shape, and the change is immediately reflected in the equation on the right side of the display.

Example

When the graph of $y = x^2$ is shifted downward, how does this affect the equation?
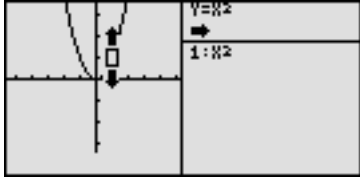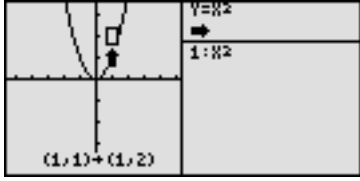
Key Operation	Display	Notes
1 2nd F SHIFT/CHANGE	ⒶSHIFT ⒷCHANGE 1Y=X² 2Y=√X 3Y=1/X 4Y=eˣ 5Y=ln X 6Y=sin X	Enter **SHIFT/CHANGE** mode. [If Ⓐ**SHIFT** is not already highlighted press ▲ .]
2 ENTER Pen/Touch	ⒶSHIFT ⒷCHANGE 1Y=X² 2Y=√X 3Y=1/X 4Y=eˣ 5Y=ln X 6Y=sin X	Select shift. Cursor moves to the equation menu.
3 ENTER Pen/Touch	Y=X² ➡ 1:X²	Select the equation: $y = x^2$ and draw the graph.
4 ▼ ▼ Pen/Touch	Y=X² ➡ 1:X² dX=0 dY=-2	Select the location of the shift: move cursor down twice.
5 ENTER Pen/Touch	Y=X² ➡X²-2 1:X²	View the result of the shift. [$y = x^2$ ↓ $y = x^2\text{-}2$]

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Change (Change the shape of the graphs) _____

Graph change function helps students grasp the relationship between an equation and its graph. Change the shape of the graph, and the change is immediately reflected in the equation on the right side of the display.

┌─ *Example* ───┐

When the graph of y = x² is changed, how does it affect the equation?

└──┘

Key Operation	*Display*	*Notes*
1 2nd F SHIFT/CHANGE ▼	ⒶSHIFT ⒷCHANGE 1Y=X² 2Y=√X 3Y=│X│ 4Y=eˣ 5Y=sin X 6Y=tan X	Enter **SHIFT/CHANGE** mode and specified (**Ⓑ CHANGE**).
2 ENTER Pen/Touch	ⒶSHIFT ⒷCHANGE 1Y=X² 2Y=√X 3Y=│X│ 4Y=eˣ 5Y=sin X 6Y=tan X	Select change. Cursor will move to the equation menu.
3 ENTER Pen/Touch	Y=X² ➡ 1:X²	Select the equation: y = x² and draw the graph.
4 ▲ Pen/Touch	Y=X² ➡ 1:X² (1,1)→(1,2)	Select the location of the change: increase the value of y-coordinates.
5 ENTER Pen/Touch	Y=X² ➡2X² 1:X²	View the result of the change. $$\left[\begin{array}{c} y = x^2 \\ \downarrow \\ y = 2x^2 \end{array}\right]$$

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Slide show

Slide show assists with teacher preparation. By selecting from the built-in options or creating your own series of slides, you can demonstrate lessons with minimum preparation time.

Example
Use the built-in slide show of $y = x^2$ to show how the coordinates change as you move along the graph.

Key Operation	Display	Notes
1 SLIDE SHOW	AB-IN / BORG / CNEW / DEDIT — 1 Y=X² / 2 Y=AX+B / 3 Y=√X / 4 Y=1/X / 5 Y=sin X / 6 Y=tan X	Specified **SLIDE SHOW** mode.
2 ENTER Pen/Touch	AB-IN / BORG / CNEW / DEDIT — 1 Y=X² / 2 Y=AX+B / 3 Y=√X / 4 Y=1/X / 5 Y=sin X / 6 Y=tan X	Select the built-in menu.
3 ENTER Pen/Touch	Y=X² graph with table X / Y: -3 9, -2 4, -1 1, 0 0, 1 1, 2 4, 3 9	Select $y = x^2$ and the first slide appears.

| **4** ▼ | | Begin the slide show by pressing the ▼ cursor key. |

▼ ▼ ▼ ▼   ▲ ▲ ▲ ▲

▼ ▼ ▼   ▲ ▲ ▲

Moving between the values you can follow the changes in the graph's coordinates, making the nature of the graph easier to understand.

▼ ▼   ▲ ▲

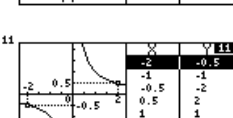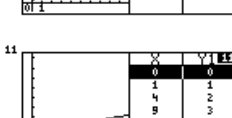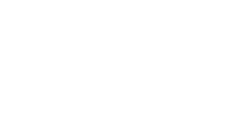* View the selection of built-in slide shows on the following pages.

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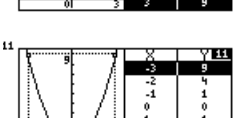
Built-in slide show selections ___

1) Y=X²   **2) Y=AX+B**   **3) Y=√X**   **4) Y=1/X**
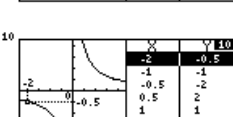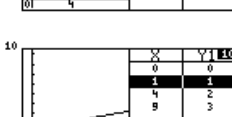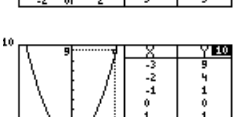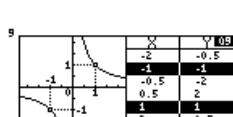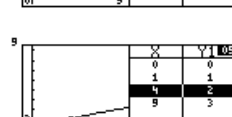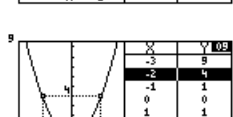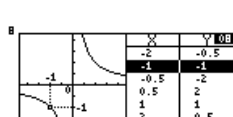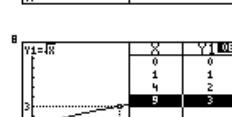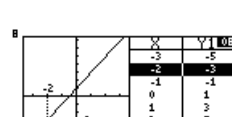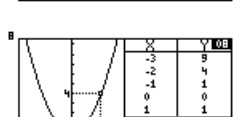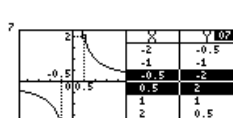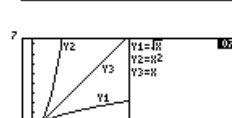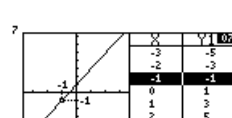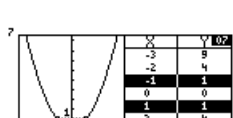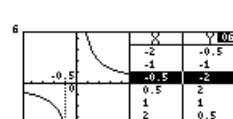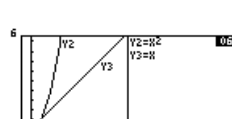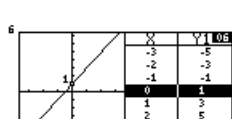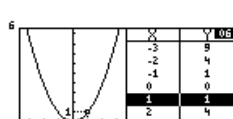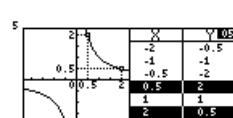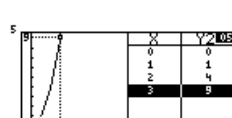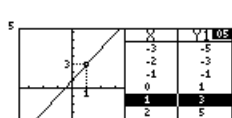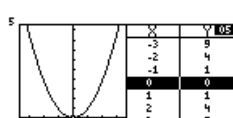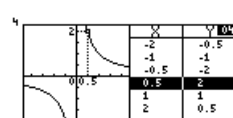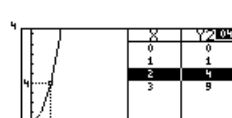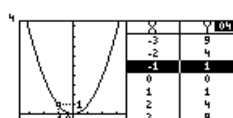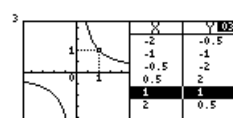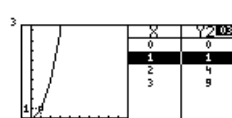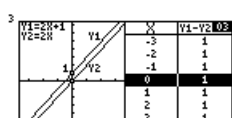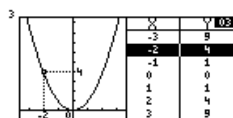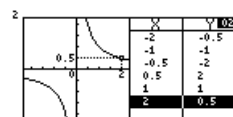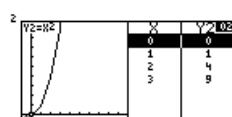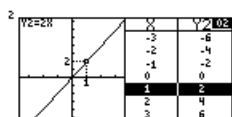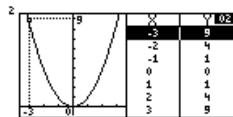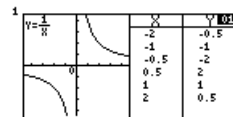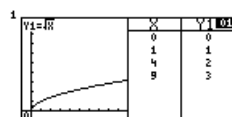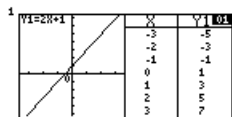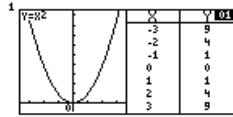
Built-in slide show selections

5) Y=sinX

6) Y=tanX

7) Y=cos⁻¹X
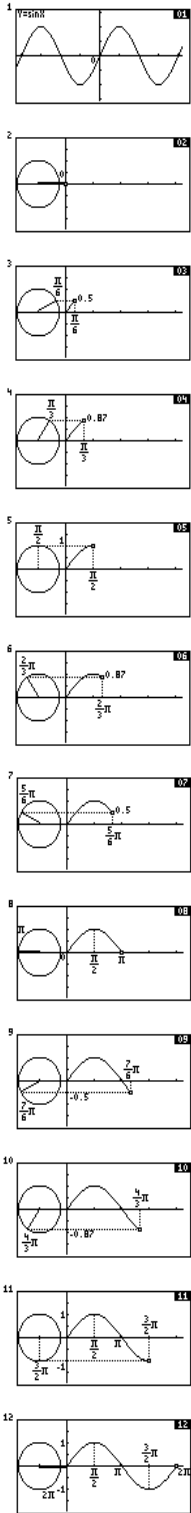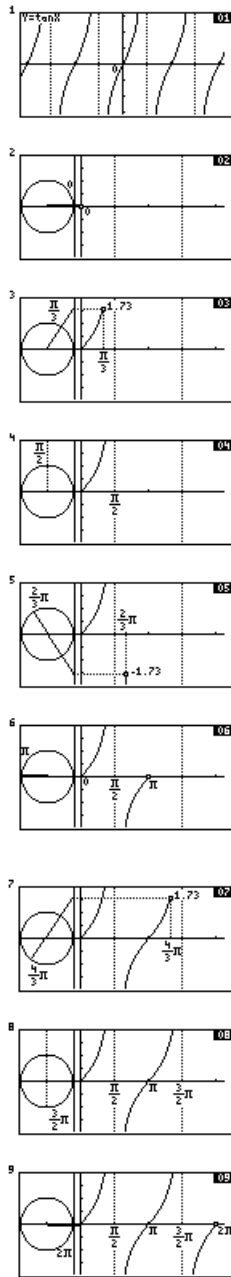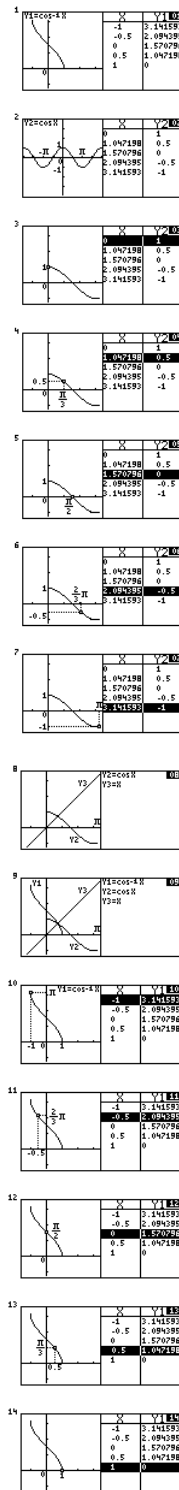
8) Y=lnX
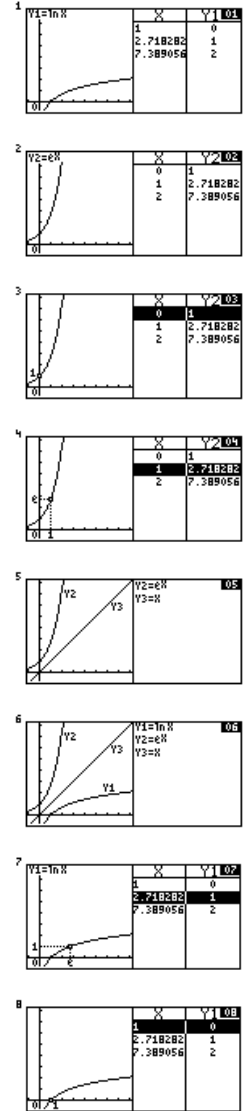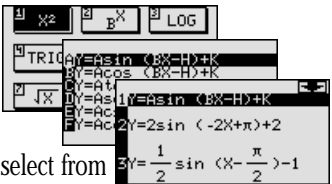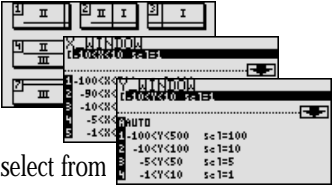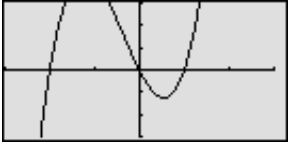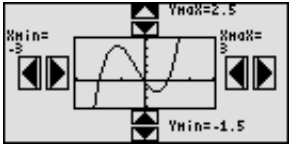
Graphing Procedures

The EL-9650/9600c has three unique functions that simplify graphing procedures: Rapid Graph, Rapid Window and Rapid Zoom. Of course, the EL-9650/9600c supports conventional graphing procedures as well.

Graphing Procedure

Following outlines graphing procedures and indicates the steps where Sharp's unique functions can be used to simplify operations. These functions are introduced on the following pages.
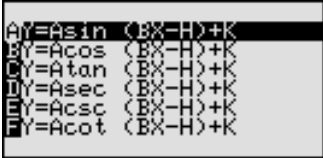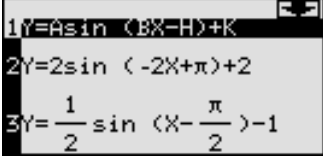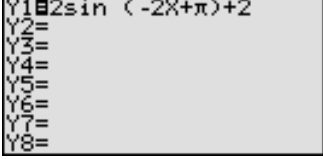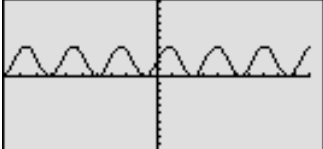
Step 1 Input equation	Manual Input	**Rapid Graph**
	Y= X/θ/T/n a^b 3 ▶ + X/θ/T/n x² − 2 X/θ/T/n	EZ Simply select from built-in menu to modify desired type of equation.

Step 2 Set X, Y range Xmin = Xmax = Xscl = Ymin = Ymax = Yscl =	Manual Input	**Rapid Window**
	WINDOW (−) 3 ENTER 3 ENTER 1 ENTER (−) 1 . 5 ENTER 1 . 5 ENTER . 5 ENTER	EZ Simply select from built-in menu to set window size.

Step 3 Draw graph	GRAPH Press Graph button to draw graph.

Step 4 Adjust viewing window	Manual Input	**Rapid Zoom**
	WINDOW Amending range size GRAPH Window (Rect) Xmin=-3 Xmax=3 Xscl=1 Ymin=-1.5 Ymax=1.5 Yscl=.5 Go back to Step 2 to readjust window size.	EZ Use arrows to adjust window size while viewing graph.

SHARP

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Rapid graph

Graphing has never been easier. With its full range of preset equations, rapid graph simplifies equation input. Use in conjunction with the rapid window function or with any graph created.

> **Example**
>
> ## Draw the graph for y = 2sin (-2x+π) + 2 using the rapid graph function.
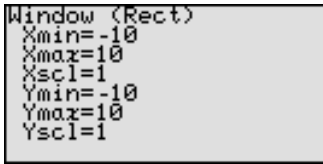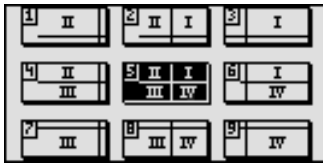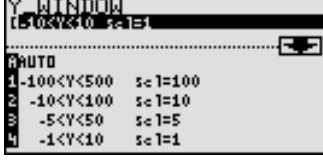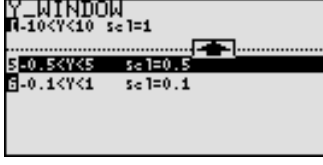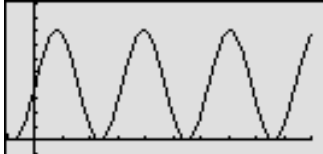
Key Operation	Display	Notes
1 Y=	Y1= Y2= Y3= Y4= Y5= Y6= Y7= Y8=	Enter the equation entry mode.
2 EZ	①X² ②ᵦˣ ③LOG ④TRIG ⑤x³ ⑥ ⑦√x ⑧ IXI	Enter Rapid Graph mode and view the equation-type menu.
3 ▼ ENTER Pen/Touch	A Y=Asin (BX-H)+K B Y=Acos (BX-H)+K C Y=Atan (BX-H)+K D Y=Asec (BX-H)+K E Y=Acsc (BX-H)+K F Y=Acot (BX-H)+K	Select the type of equation: Trigonometric, and view the equation format menu.
4 ENTER Pen/Touch	1 Y=Asin (BX-H)+K 2 Y=2sin (-2X+π)+2 3 Y=$\frac{1}{2}$ sin (X-$\frac{\pi}{2}$)-1	Select the sin equation format and view the sin equation style.
5 ▼ ENTER Pen/Touch	Y1■2sin (-2X+π)+2 Y2= Y3= Y4= Y5= Y6= Y7= Y8=	Select the second equation style and input. If necessary, make changes to the coefficients.
6 GRAPH		Draw the graph. (Note: Previous range values may affect the viewing window. To reset range values, use Rapid Window.)

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Rapid window

Rapid window simplifies setting window size with a range of preset values. Use in conjunction with the rapid graph function or with any graph created.

Example

After using Rapid Graph to draw the graph of y = 2sin (-2x+π) + 2 (refer p. 12), set the viewing window using the rapid window function.

Key Operation	Display	Notes
1 WINDOW	Window (Rect) Xmin=-10 Xmax=10 Xscl=1 Ymin=-10 Ymax=10 Yscl=1	Enter viewing window setup mode.
2 EZ		Enter Rapid Window mode.
3 ▲ ▶ ENTER Pen Touch (or 3 ENTER)	X_WINDOW [-10<X<10 scl=1] 1 -100<X<500 scl=100 2 -90<X<720 scl=90 3 -10<X<100 scl=10 4 -5<X<50 scl=5 5 -1<X<10 scl=1	Select the No. 3 style and view the X-range menu.
4 ▼ ENTER (Five times) Pen Touch (or 5 ENTER)	Y_WINDOW [-10<X<10 scl=1] A AUTO 1 -100<Y<500 scl=100 2 -10<Y<100 scl=10 3 -5<Y<50 scl=5 4 -1<Y<10 scl=1	Select X-range No. 4: (-1 < X < 10 scl=1), and view the Y-range menu.
5 ALPHA ▼ Pen Touch (or 5)	Y_WINDOW 4 -10<Y<10 scl=1 5 -0.5<Y<5 scl=0.5 6 -0.1<Y<1 scl=0.1	Move the cursor to No. 5: (-0.5 < Y < 5 scl=0.5)
7 ENTER		Select the Y-range and draw the graph.

Rapid zoom

Rapid zoom offers one-touch adjustment of window size while viewing the graph. No more guessing or wasting class time to find optimal values for window size.

Example

Adjust the viewing window for y = x³ + x² - 2x to show the entire graph.

Key Operation	Display	Notes

1
Y=	X/θ/T/n	aᵇ	3	▶	+
X/θ/T/n	x²	—	2	X/θ/T/n
WINDOW	(−)	3	ENTER	3
ENTER	1	ENTER
(−)	1	·	5	ENTER	1	·	5
ENTER	·	5	ENTER	GRAPH
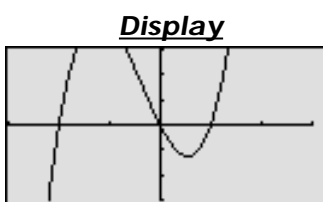
Create the graph $y = x^3 + x^2 - 2x$ using the following conditions:
X-range: xmin = -3
xmax = 3
xscl = 1
Y-range: ymin = -1.5
ymax = 1.5
yscl = 0.5

---

2 EZ
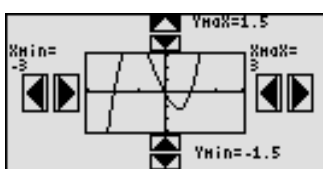
Enter Rapid Zoom mode.

3 ENTER

Pen/Touch
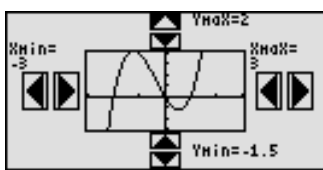
Change Y-range from Ymax = 1.5 to Ymax=2. Draw the graph.

4 ENTER

Pen/Touch
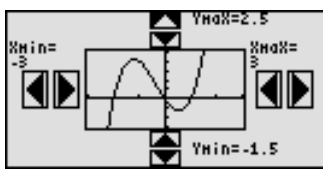
Repeat: Change Y-range from Ymax = 2 to Ymax=2.5. Draw the graph

5 GRAPH
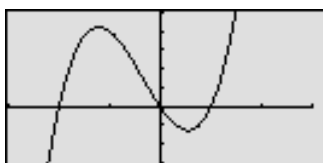
View display (adjusted).

SHARP

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PC-LINK

Connect the EL-9650/9600c with a PC or Macintosh computer to expand the possibilities of data exchange using PC-Link software.

CE-LK1P (PC-link system)

PC-Link Software

PC conversion connector for IBM-PC

IBM PC® or Compatibles

CE-450L

PC-Link Software

PC conversion connector for Macintosh

PC-LINK adaptor
Protocol conversion
(3pin➔RS-232C)
Level conversion

Macintosh®
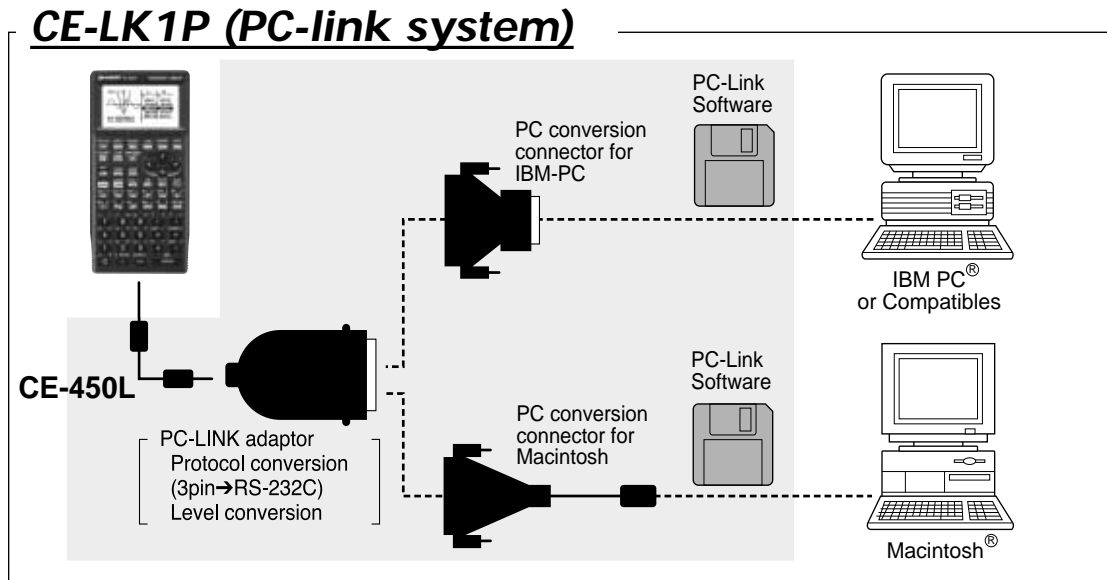
What is PC LINK?
- Creates and edits EL-9650/9600c programs on a PC.
- Receives and saves programs and various data from EL-9650/9600c.
- Makes a backup of all the contents of EL-9650/9600c.
- Sends programs and various data to EL-9650/9600c.
- Loads image data of EL-9650/9600c.
- Converts programs and various data files into a Text File. Converts program text files into a Program File.
- Prints out programs and various data files.

Procedure

1 Turn off the EL-9650/9600c.

2 Connect the EL-9650/9600c to the PC by using the CE-450L, PC-Link adaptor and PC connector (see above diagram).

3 Make sure that the RS-232C (serial port) is connected to the PC. Use of the connector is determined by the shape of the PC serial port (see below chart).

4 Open PC-Link Software.

5 Switch on EL-9650/9600c.

  * It is essential to use the same port for both the PC and the PC-Link Software.

6 Operate according to the instructions on the screen.
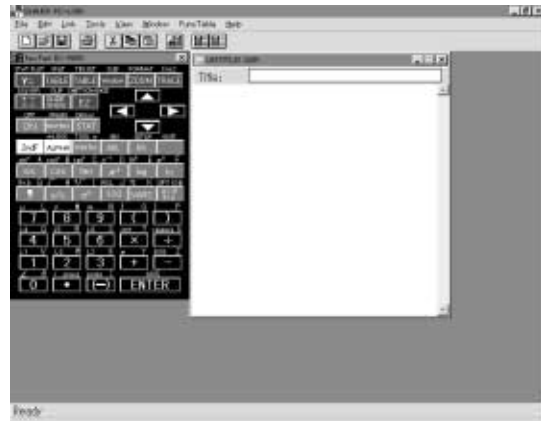
Shape of PC serial port	Connecting procedure
25 pin (male)	Connect the other side (25-pin side) of PC LINK adaptor to the serial port for the PC.
9 pin (male)	Connect the other side (25-pin side) of PC LINK adaptor to the 25-pin terminal of a converting adaptor. Also connect the other side (9-pin side) of the converting adaptor to the serial port for the PC.
8 pin (female)	For Macintosh

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Set to set communication

Transfer data between two EL-9650/9600c calculators using the communication cable (CE-450L).

CE-450L (Communication cable)

EL-9650/9600c   **CE-450L**
Communication cable   **EL-9650/9600c**
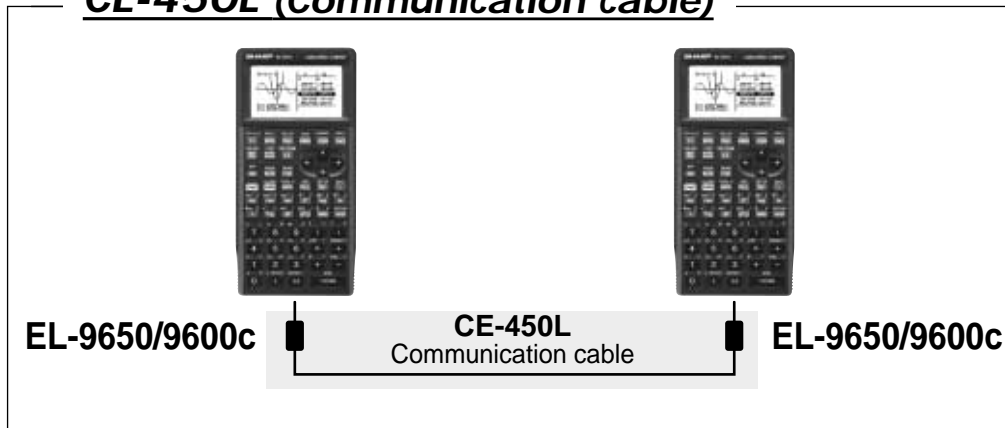
Communication Procedure

1 Plug the cable into both calculators.

2 Turn power on.

3 **Receiver**
2nd F OPTION
Pen/Touch ▼ ▼ ▼
(or D)

ACTRST
BMEMCHK 1SEND
CDEL   2RECEIVE
DLINK
ERESET
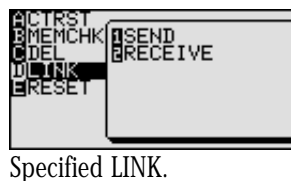
Specified LINK.

4 ENTER ▼
Pen/Touch ENTER (or 2)

RECEIVING
[ON] to cancel
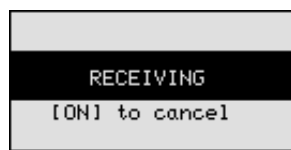
Select LINK/RECEIVE.

5 **Sender**
2nd F OPTION
Pen/Touch ▼ ▼ ▼
(or D)

ACTRST
BMEMCHK 1SEND
CDEL   2RECEIVE
DLINK
ERESET

Specified LINK.

6 ENTER ENTER
(or 1)
Pen/Touch

ASELECT
BBACKUP 01ALL
         02List
         03Matrix
         04Graph Eqn
         05Solver Eqn
         06Program

Select LINK/SEND.

7 ENTER ENTER
Pen/Touch

Select Data
L1   :List
L2   :List
Y1   :Graph
Y2   :Graph
Y3   :Graph
↓ ABC   :Program
        send * data

Select SEND/ALL.

[List of sendable data will appear on screen.]

8 ENTER
Pen/Touch ▼ ▼
ENTER

Select Data
*L1   :List
L2   :List
*Y1   :Graph
Y2   :Graph
Y3   :Graph
↓ ABC   :Program
        send * data

Select 'LI', 'YI'
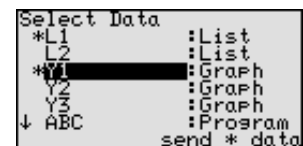
[* mark desired data to be sent.]

9 2nd F EXE

SENDING
[ON] to cancel
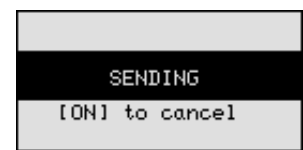
Execute Sending function.

List of the SEND menu

A SELECT	Sends files individually as described below.
01 ALL	Selects and displays all files.
02 List	Selects and displays all list files.
03 Matrix	Selects and displays all matrix files.
04 Graph Eqn	Selects and displays all graph equations.
05 Solver Eqn	Selects and displays all solver equations.
06 Program	Selects and displays all program files.
07 G_Data	Selects and displays all graph data files.
08 L_Data	Selects and displays all list data files.
09 Picture	Selects and displays all picture data files.
10 Slide	Selects and displays all self-made slide shows.
11 A~Z, Ø	Selects and displays all fixed memory of A to Z, and Ø
B BACKUP	Menu to send all file data. Use this feature to send the entire content.

SHARP

OHP System

Use the EL-9650/9600c OHP system with the overhead projector to make classroom presentations convenient for the whole class to see.

EL-965T/96Tc (OHP system)

AC adaptor (optional)

OHP Projection Panel

OHP Panel Controller

CE-450L
The CE-450L is included for separate use (see page 16)
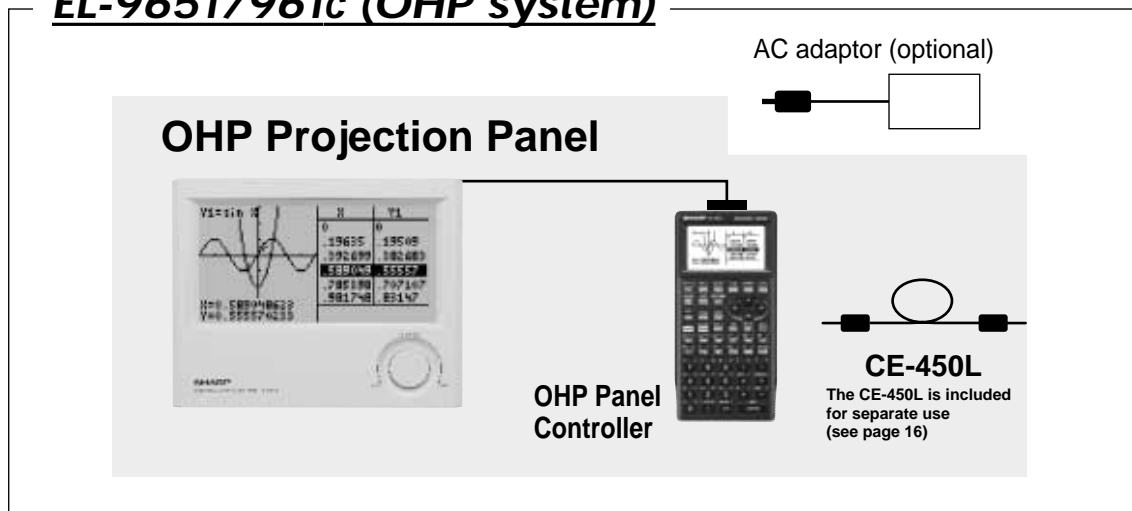
Procedure

1 Switch off the OHP Panel Controller.

2 Plug the cable connector of the OHP Projection Panel straight into the connection terminal of the OHP Panel Controller.

(The optional AC adaptor is recommended for extended use of the OHP Projection Panel.)

3 Switch on the OHP Panel Controller.

4 Operating the OHP Panel Controller.

The OHP Projection Panel display is synchronized with the display of the OHP Panel Controller.
Place the OHP Projection Panel on top of the overhead projector to project images onto the screen.

5 Turn on the power to the overhead projector.

SHARP

Menu tree 1

SET UP ([2ndF] [SET UP])

A ———	B DRG	C FSE	D TAB	E COORD
Rad	1 Deg	1 FloatPt	1 1	1 Rect
FloatPt	2 Rad	2 Fix	2 2	2 Param
9	3 Grad	3 Sci	3 3	3 Polar
Rect		4 Eng	4 4	4 Seq
Decimal (Real)			5 5	
Equation			6 6	
			7 7	
			8 8	
			9 9	
			0 0	

F AMSWER	G EDITOR
1 Decimal (Real)	1 Equation
2 Mixed (Real)	2 One Line
3 Improp (Real)	
4 x+yi (complex)	
5 r∠θ (complex)	

FORMAT ([2ndF] [FORMAT])

A ———	B CURSOR	C EXPRES	D Y¹	E STYLE1
RectCursor	1 RectCoord	1 ON	1 ON	1 Connect
OFF	2 PolarCoord	2 OFF	2 OFF	2 Dot
OFF				
Connect				
Sequen				

F STYLE 2
1 Sequen
2 Simul

*When coordinate system is Rect, palm or polar

FORMAT ([2ndF] [FORMAT])

A ———	B CURSOR	C EXPRES	D Y¹	E PLOT1
RectCursor	1 RectCoord	1 ON	1 ON	1 Connect
ON	2 PolarCoord	2 OFF	2 OFF	2 Dot
ON				
Connect				
Sequen				
Web				

F PLOT2	G TYPE
1 Sequen	1 Web
2 Simul	2 Time
	3 uv
	4 uw
	5 vw

*When coordinate system is Seq.

MATH ([MATH])

A CALC		B NUM	C PROB	D CONV
01 log2	11 cot	1 abs(	1 random	1 →deg
02 2ˣ	12 sec⁻¹	2 round(	2 nPr	2 →dms
03 fmin(	13 csc⁻¹	3 ipart	3 nCr	3 xy→r(
04 fmax(	14 cot⁻¹	4 fpart	4 I	4 xy→θ(
05 d/dx(	15 sinh	5 int		5 rθ→x(
06 ∫	16 cosh	6 min(		6 rθ→y(
07 dx	17 tanh	7 max(		
08 Σ(	18 sinh⁻¹	8 lcm(		
09 sec	19 cosh⁻¹	9 gcd(		
10 csc	20 tanh⁻¹			

E ANGLE	F INEQ	G LOGIC	H COMPLX
1 °	1 =	1 and	1 conj(
2 '	2 ≠	2 or	2 real(
3 "	3 >	3 not	3 image(
4 ʳ	4 ≥	4 xor	4 abs(
5 ᵍ	5 <	5 xnor	5 arg(
	6 ≤		

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Menu tree 2

When coordinate system is Rect

```
CALC         ( 2ndF  CALC )

    CALC
1 Value
2 Intsct
3 Minimum
4 Maximum
5 X_Incpt
6 Y_Incpt
7 Inflec
```

MATH menu on the NBASE calculation

```
N-MATH       ( 2ndF  TOOL  MATH )

    A LOGIC
1 and
2 or
3 not
4 neg
5 xor
6 xnor
```

When coordinate system is Polar, Param or Seq

```
CALC         ( 2ndF  CALC )

    CALC
1 Value
```

```
LIST         ( 2ndF  LIST )
```

A OPE	B MATH	C L_DATA
1 sortA(	1 min(	1 stoLD
2 sortD(	2 max(	2 RclLD
3 dim(	3 mean(	
4 fill(	4 median(	
5 seq(	5 sum(	
6 cumul	6 prod(	
7 df_list	7 stdDv(	
8 augment(	8 varian(	
9 list→mat(		
0 mat→list(		

```
STAT         ( STAT )
```

A EDIT	B OPE	C CALC	D LINE	
edit list	1 sortA(	1 1_Stats	01 Med_Med	08 Rg_log
	2 sortD(	2 2_Stats	02 Rg_ax+b	09 Rg_ab^x
Press ENTER	3 SetList	3 ANOVA(	03 Rg_a+bx	10 Rg_ae^{bx}
	4 ClrList		04 Rg_x^2	11 Rg_x^{-1}
			05 Rg_x^3	12 Rg_ax^b
			06 Rg_x^4	13 x'
			07 Rg_ln	14 y'

E TEST		F DISTRI	
01 x^2test	10 Ztest1prop	01 pdfnorm(	08 cdfF(
02 Ftest2samp	11 Ztest2prop	02 cdfnorm(	09 pdfbin(
03 Ttest1samp	12 Zint1samp	03 InvNorm(	10 cdfbin(
04 Ttest2samp	13 Zint2samp	04 pdfT(	11 pdfpoi(
05 TtestLinreg	14 Zint1prop	05 pdf x^2(	12 cdfpoi(
06 Tint1samp	15 Zint2prop	06 cdf x^2(	13 pdfgeo(
07 Tint2samp	16 InputList	07 pdfF(	
08 Ztest1samp	17 Input Stats		
09 Ztest2samp			

```
DRAW         ( 2ndF  DRAW )
```

A DRAW	B POINT	C ON/OFF	D LINE	E G_DATA
1 ClrDraw	1 PntON(	1 DrawON	select	1 StoGD
2 Line(	2 PntOFF(	2 DrawOFF	line type	2 RclGD
3 H_Line	3 PntCHG(			
4 V_Line	4 PxlON(		Press ENTER	
5 T_Line(	5 PxlOFF(			
6 Draw	6 PxlCHG(			
7 Shade(	7 PxlTST(			
8 DrawInv				
9 Circle(				
0 Text(				

F PICT	G SHADE
1 StoPict	1 SET
2 RclPict	2 INITIAL

SHARP

Menu tree 3

ZOOM (ZOOM)

A ZOOM
1 Auto
2 Box
3 In
4 Out
5 Default
6 Square
7 Dec
8 Int
9 Stat

B FACTOR
Set factor
of zoom

Press ENTER

C POWER
1 X²
2 X⁻¹
3 √X

D EXP
1 10ˣ
2 eˣ
3 log x
4 ln x

E TRIG
1 sin x
2 cos x
3 tan x
4 sin⁻¹ x
5 cos⁻¹ x
6 tan⁻¹ x

F HYP
1 sinh x
2 cosh x
3 tanh x
4 sinh⁻¹ x
5 cosh⁻¹ x
6 tanh⁻¹ x

G STO
1 StoWin

H RCL
1 RclWin
2 PreWin

PROGM-COM (2ndF PRGM on Program screen)

A PRGM
1 Print
2 "
3 Input
4 Wait
5 Rem
6 End

B BRNCH
1 Label
2 Goto
3 If
4 Gosub
5 Return

C SCRN
1 ClrT
2 ClrG
3 DispT
4 DispG

D I/O
1 Get
2 Send

E COORD
1 Rect
2 Param
3 Polar
4 Web
5 Time
6 uv
7 uw
8 vw

F FORM
1 RectCursor
2 PolarCursor
3 ExprON
4 ExprOFF
5 Y' ON
6 Y' OFF
7 Connect
8 Dot
9 Sequen
0 Simul

G S_PLOT
1 Plt1(
2 Plt2(
3 Plt3(

H COPY
1 StoLine
2 RclLine

VARS (VARS)

A EQVARS
Graph equation

Press ENTER

B WINDOW
Value of
window

Press ENTER

C STOWIN
Value of
stored window

Press ENTER

L_DATA
1 L_Data 1
2 L_Data 2
3 L_Data 3
4 L_Data 4
5 L_Data 5
6 L_Data 6
7 L_Data 7
8 L_Data 8
9 L_Data 9
0 L_Data 0

E G_DATA
1 G_Data 1
2 G_Data 2
3 G_Data 3
4 G_Data 4
5 G_Data 5
6 G_Data 6
7 G_Data 7
8 G_Data 8
9 G_Data 9
0 G_Data 0

F PICTUR
1 Pict1
2 Pict2
3 Pict3
4 Pict4
5 Pict5
6 Pict6
7 Pict7
8 Pict8
9 Pict9
0 Pict0

G TABLE
1 TBLStrt
2 TBLStep
3 TBLList

H STAT
Statistics

Press ENTER

SHARP

Menu tree 4

EQ VAR (VARS A)

A XY
1 Y1
2 Y2
3 Y3
4 Y4
5 Y5
6 Y6
7 Y7
8 Y8
9 Y9
0 Y0

B XYT
01 X1T	07 X4T
02 Y1T	08 Y4T
03 X2T	09 X5T
04 Y2T	10 Y5T
05 X3T	11 X6T
06 Y3T	12 Y6T

C Rθ
1 R1
2 R2
3 R3
4 R4
5 R5
6 R6

WIN VAR (VARS B)

A XY
1 Xmin
2 Xmax
3 Xscl
4 Ymin
5 Ymax
6 Yscl
7 X_Fact
8 Y_Fact

B T
1 Tmin
2 Tmax
3 Tstep

Cθ
1 θmin
2 θmax
3 θstep

D SEQ
1 nMin
2 nMax
3 u(nMin)
4 v(nMin)
5 w(nMin)
6 PlotStart
7 PlotStep

ZOOM VAR (VARS C)

A STOXY
1 Zm_Xmin
2 Zm_Xmax
3 Zm_Xscl
4 Zm_Ymin
5 Zm_Ymax
6 Zm_Yscl

B STOT
1 Zm_Tmin
2 Zm_Tmax
3 Zm_Tstp

C STOθ
1 Zm_θmin
2 Zm_θmax
3 Zm_θstep

D STOSEQ
1 Zm_nMin
2 Zm_nMax
3 Zm_u(nMin)
4 Zm_v(nMin)
5 Zm_w(nMin)
6 Zm_PltStart
7 Zm_PltStep

STAT VAR (VARS H)

A XY
01 n	09 Σy
02 $\bar{x}$	10 $\bar{y}$
03 sx	11 sy
04 σx	12 σy
05 xmin	13 ymin
06 xmax	14 ymax
07 Σx	15 Σy
08 Σx^2	16 Σy^2

B REGEQN
1 RegEqn
2 a
3 b
4 c
5 d
6 e
7 r
8 r^2
9 R^2
0 resid

C POINTS
1 x1
2 x2
3 x3
4 y1
5 y2
6 y3
7 Q1
8 Med
9 Q3

D TEST
01 p	
02 z	11 n1
03 t	12 n2
04 x^2	13 $\bar{x}$1
05 F	14 $\bar{x}$2
06 df	15 sx1
07 $\hat{p}$	16 sx2
08 $\hat{p}$1	17 sxp
09 $\hat{p}$2	18 lower
10 s	19 upper

MATRIX (MATRIX)

A NAME
1 mat A
2 mat B
3 mat C
4 mat D
5 mat E
6 mat F
7 mat G
8 mat H
9 mat I
0 mat J

B EDIT
1 mat A
2 mat B
3 mat C
4 mat D
5 mat E
6 mat F
7 mat G
8 mat H
9 mat I
0 mat J

C OPE
01 dim(	07 row_swap(
02 fill(	08 row_plus(
03 cumul	09 row_mult(
04 augment(	10 row_m.p.(
05 identity	11 mat→list
06 rnd_mat(	12 list→mat

D MATH
1 det
2 trans
3 rowEF
4 rrowEF

E [ ]
1 [
2]

PRGM (2ndF PRGM)

A EXEC
01
02
03
04
05
06

B EDIT
01
02
03
04
05
06

C NEW
Create
new program

Press ENTER

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Menu tree 5

STAT PLOT (2nd F STATPLOT)

A PLOT1	B PLOT2	C PLOT3	D LIMIT	E ON/OFF
Stat plot1	Stat plot2	Stat plot3	1 SET	1 PlotON
			2 LimON	2 PlotOFF
Press ENTER	Press ENTER	Press ENTER	3 LimOFF	

OPTION (2nd F OPTION)

A CTRST	B MEMCHK	C DEL	D LINK	E RESET
	Remain	1 List	1 SEND	1 default set
	12345bytes	2 Matrix	2 RECEIVE	2 All memory
		3 Graph Eqn		
	Press ENTER	4 Solver Eqn		
	to detail	5 Program		
		6 Picture		
		7 G.Data		
		8 L.Data		
		9 Slide		
		0 Entry		

STAT GRAPH (2nd F STATPLOT on PLOT1-3screen)

A HIST	B B.L.	C N.P.	D N.D.	E BOX
1 Hist	1 Broken•	1 Norm•X	1 NormDis	1 Box
	2 Broken+	2 Norm+_X		
	3 Broken□	3 Norm□_X		
		4 Norm•_Y		
		5 Norm+_Y		
		6 Norm□_Y		

F MBOX	G S.D.	H XYLINE
1 MBox•	1 Scattr•	1 xyLine•
2 MBox+	2 Scattr+	2 xyLine+
3 MBox□	3 Scattr□	3 xyLine□

SLIDE (SLIDESHOW)

A B-IN	B ORG	C NEW	D EDIT
1 $Y = X^2$	0 screen		1 MOVE
2 $Y = AX+B$			2 DEL
3 $Y = \sqrt{X}$	Press ENTER	Press ENTER	3 RENAME
4 $Y = 1/X$			
5 $Y = \sin X$			
6 $Y = \tan X$			
7 $Y = \cos^{-1} X$			
8 $Y = \ln X$			

SHIFT/CHANGE (2nd F SHIFT/CHANGE)

A SHIFT	B CHANGE
1 $Y = X^2$	1 $Y = X^2$
2 $Y = \sqrt{X}$	2 $Y = \sqrt{X}$
3 $Y = 1/X$	3 $Y = |X|$
4 $Y = e^x$	4 $Y = e^x$
5 $Y = \ln X$	5 $Y = \sin X$
6 $Y = \sin X$	6 $Y = \tan X$
7 $Y = \tan X$	
8 $Y = |X|$	

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Menu tree 6

SOLVER ([2ndF] [SOLVER] on SOLVER screen)

A METHOD	B EQTN	C SAVE	C RENAME
1 Equation	1	Press [ENTER]	1
2 Newton	2		2
3 Graphic	3		3
	4		4
	5		5
	6		6
	7		7
	8		8
	9		9
	0		0

TOOL ([2ndF] [TOOL])

A NBASE	B SYSTEM	C POLY
Calculate	2 2	2 2
Hexadecimal	3 3	3 3
Decimal	4 4	Select degree
Octal	5 5	
Binary	6 6	
	Select number	
Press [ENTER]		

Y= ([Y=])

RECT MODE	PAR MODE	POL MODE	SEQ MODE
Y1=	X1T=	R1=	u(n)=
Y2=	Y1T=	R2=	u(nMin)=
Y3=	X2T=	R3=	v(n)=
Y4=	Y2T=	R4=	v(nMin)=
Y5=	X3T=	R5=	w(n)=
Y6=	Y3T=	R6=	w(nMin)=
Y7=	X4T=		
Y8=	Y4T=		
Y9=	X5T=		
Y0=	Y5T=		
	X6T=		
	Y6T=		

FINANCE ([2ndF] [FINANCE])

A SOLVER	B CALC		C PERIOD	D VARS
TVM Solver	01 slv_pmt		1 PmtEnd	1 N
	02 slv_1%	08 Bal(	2 PmtBegin	2 1%
Press [ENTER]	03 slv_PV	09 ∑Pm(		3 PV
	04 slv_N	10 ∑Int(		4 PMT
	05 slv_FV	11 →Apr(		5 FV
	06 Npv(	12 →Eff		6 P/Y
	07 Irr(	13 days(		7 C/Y

LINK ([2ndF] [OPTION] [D] 1))

A SELECT		B BACKUP
01 All		back up
02 List	07 G_Data	
03 Matrix	08 L_Data	Press [ENTER]
04 Graph eqn	09 Picture	
05 Solver eqn	10 Slide	
06 Program	11 A~Z,θ	

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Specifications

Dimensions W x D x H (mm)			183 x 86 x 19.5 (without hardcase)
Power			R03 (AAA) x 4
Backup Battery			CR2032 x 1
Display	Size (dot)		132 x 64
	Line x Characters		8 x 22
	Character Size (dot)		5 x 7
	Digits (mantissa + exponent)		10 + 2
Memory	Total Memory Size		32 KB
	Constant Memory		27 + last answer memory
Accessory	Protective hard case		
Standard Features	Graphing	Function graphing	Up to 10
		Parametric graphing	Up to 6
		Polar graphing	Up to 6
		Sequence graphing	Up to 3
		Split screen	Graph-table/graph-equation
		Graph style	
		Zoom, Trace	
		Table of function values	
	Statistics	Regression models	12
		Scatter Plots and Histograms	
		Box-and-Whisker Diagrams	
		Inferential statistics	
		Probability Distributions	
	Other	Matrix	Up to 10 (Maximum size : 99 x 99)
		List	Up to 6 (Maximum length : 999)
		Programming	
		Trigonometry functions (including sec, csc, cot)	
		Solver	
		Complex numbers	
		Financial calculation	
		Fraction/Decimal conversions	
		Last entry recall (up to 160 steps)	
		Last answer recall	
Features unique to Sharp	Pen-touch screen, Equation editor, Shift/Change, Slide show (Built-in/Original), Rapid graph, Rapid window, Rapid zoom, List grouping, Σ calculation, Simultaneous equation		
Peripheral	CE-450L		Unit-to-unit communications cable
	CE-LK1P		PC-Link (Print screen/Data storage)
	EL-965T/96Tc		OHP system (includes controller)

* Design and specifications are subject to change without notice.
* Some products may not be available in some countries.

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EL-9650/9600c Graphing Calculator